AMENDMENTS TO THE DRAWINGS:

Please find accompanying this response replacement sheets for Figs. 1 and 3 wherein amendments explained in the Remarks presented below are effected.

The drawing amendments effect the following changes:

Figure 1:

A magnet 21, magnet 23 and heating device 25 are added to Figure 1. Support for these amendment is found in the original specification at page 7, lines 3-7. Also see the marked specification at page 10, lines 5-10.

Figure 3:

Part number 35, 37, and 39 are added to Figure 3 to refer to a magnetic source 35, the primary side piping 37, and the secondary side piping 39. A heating device 33 is added to Figure 3. Support for the heating device 33 and magnetic source 35 is found in the original specification at page 4, lines 1-2, and page 7, line 24 to page 8, line 2. Also see the marked specification at page 11 lines 10-17. Support for the primary side piping 27 and secondary side piping 39 is found in the original specification at page 4, lines 11-16. Also see marked specification at page 13, line 20 to page 14, line3.

No new matter is added.

REMARKS

Claims 10-21 are now pending in this application. Claims 1-9 are cancelled herein. The drawings are objected to. The specification is objected to. Claim 9 is objected to. Claims 1-9 are rejected. New claims 10-21 are added. The subject matter of claims 10-18 generally tracks the subject matter of original claims 1-9. Claims 19-21 recite additional distinctions. No new matter is added.

Applicants respectfully submit that, upon entry of the subject amendment, the application will be in condition for allowance. Applicants, thus, respectfully request consideration of the above amendment and the following remarks.

<u>Objections to the Drawings:</u>

Objections to the drawings, along with remarks, are addressed in a separate section above.

<u>Objections to the Specification:</u>

Applicants submit herewith a substitute specification wherein amendments are effected to place the text thereof into proper English in accordance with 37 CFR 1.125(c). Also accompanying this amendment is a reproduction of the original specification and abstract with markings indicating

the amendments effected in the substitute specification in accordance with MPEP §608.01(q) and 37 CFR 1.125(b). No new matter is added. Entry of the substitute specification and abstract is respectfully requested.

Objection to Claim 9:

Claim 9 is cancelled.

Section 112 Rejections:

The claims have been rejected under 35 USC 112, second paragraph as being indefinite for failing to conform to current U.S. practice. Claims 1-9 are cancelled and new claims 10-18 submitted which generally track the subject matter of claims 1-9, respectively. Claims 10-18 conform to U.S. practice and include many of the suggestions provided by the Examiner.

Section 103 Rejections:

Claims 1-9 are rejected under 35 USC 103(a) as being unpatentable over Ryan et al (U.S. Patent No. 5,934,103) in view of Shino et al. (U.S. Patent No. 5,039,500). Claims 1-8 are rejected under 35 USC 103(a) as being unpatentable over Ryan et al in view of Raftery et al., "High-Field NMR of

Adsorbed Xenon Polarized by Laser Pumping," Phys. Rev. Lett. 66 (5), pp. 584-587.

Several of Applicants' claims are directed to methods and apparatus for producing a glass cell filled with solid rubidium and solid xenon. Other of Applicants' claims are directed to methods and apparatus for producing nuclear spin polarized xenon gas in such glass cell.

The primary reference, **Ryan et al.**, discloses a method and apparatus for producing spin-polarized xenon gas by laser optical pumping. A reactor vessel 24 having solid rubidium 36 is placed between magnetic poles which maintain a flux of about 50 Gauss, (Col. 3, lines 47-54). A heater element 34 maintains the rubidium at about 80-90 degrees Centigrade causing molecules of rubidium gas to rise, (Col. 3, lines 60-64). The vessel 24 receives a flow of xenon gas mixed with nitrogen gas (Col., 4, lines 1) and helium gas, (Col. 5, lines 46-55). The vessel 24 is pumped with laser light energy from a laser 50, (Col. 4, lines 15-21), which in combination with the magnetic field spin polarizes a significant fraction of the rubidium gas, (Col. 4, lines 23-25). The polarized rubidium gas molecules in turn spin polarize a significant fraction of the xenon gas, (Col. 5, lines 7-8). A mixed flow of xenon and rubidium gases enter a cryogenic rubidium condenser / separator apparatus 56 where the gases are chilled as low as -60 degrees Centigrade, (Col. 5, lines 15-23). Some of the

rubidium and xenon solidifies and is thus removed from the xenon gas flow. The remaining xenon gas flow then is reheated and passed to a patient for use in an NMR/MRI process, (Col. 5, lines 29-31).

Of particular significance is that Ryan et al. do not produce a glass cell filled with solid rubidium and solid xenon. Further, Ryan et al. do not produce spin polarized xenon gas in a cell filled with solid xenon and solid rubidium. Ryan et al. flow xenon gas into a vessel having solid rubidium to generate the spin polarized xenon gas.

Shino et al. disclose a process for producing xenon gas from liquid oxygen. The Examiner cites Shino et al. as teaching that xenon gas may be cooled to solidify it for purposes of concentrating the xenon and separating out impurities.

Raftery et al. disclose a high-field NMR process using adsorbed xenon polarized by laser pumping. The Examiner cites Raftery et al. as teaching the introduction of xenon gas into a system and cooling it to adsorb it onto a surface. We note that by definition adsorbtion is the formation of a thin layer onto a solid surface, and thus is not equivalent to forming a cell filled with solid xenon (and solid rubidium). There is no teaching of producing a solid xenon raw material as a highly concentrated xenon source for producing a spin polarized xenon gas.

The Claims Distinguished

Independent method **claim 10** and corresponding independent apparatus **claim 15** distinguish over the cited art based at least upon the following claim distinctions:

- **heating a glass cell filled with solid rubidium and solid xenon in the pressure reducing state of being absent in oxygen** to produce therein gaseous xenon and a mixture of gas and liquid phases of rubidium.

It is respectfully submitted that the cited art does not disclose heating a glass cell filled with solid rubidium and solid xenon in a pressure reducing state of being absent in oxygen. The examiner acknowledges that Ryan lacks such teaching and relies on the Shino et al. reference. However, Shino et al. merely disclose a method for producing a xenon gas of high concentration from liquid oxygen. The liquid oxygen (with parts of xenon and krypton) is gassified, then cooled. The cooling causes adsorbtion of xenon in a silica gel. The xenon is further cooled and frozen. The frozen xenon then is heated to produce a concentrated xenon gas. It is respectfully submitted that teaching that xenon gas can be frozen does not suggest that a glass cell filled with solid xenon (and solid rubidium) in the pressure reducing state may be an effective source to be heated for producing nuclear spin polarized xenon gas.

We note that Applicants do not freeze xenon for the purpose of removing impurities in the process for producing spin polarized xenon gas. Applicants start with a highly concentrated xenon gas and freeze it to form a raw material encapsulating solid rubidium in a cell that then may be used for generating a highly concentrated polarized xenon gas. The output of the spin polarized xenon gas from the glass cell need not be frozen to serve as medical grade xenon gas for NMR/MRI processes.

Claims 11, 12 and 13 ultimately depend from claim 10 and distinguish over the cited art at least for the same reasons as given for claim 10.

Claims 16 and 17 ultimately depend from claim 15 and distinguish over the cited art at least for the same reasons as given for claim 15.

Independent method **claim 14** distinguishes over the cited art based at least upon the following claim limitations:

- producing a glass cell **filled with solid rubidium and solid xenon in a vacuum;**
- cooling the glass cell causing rubidium to precipitate as a solid within the glass cell;
- **filling the glass cell having solid rubidium with xenon gas;**
- **isolating the glass cell**; and

- **cooling the isolated glass cell causing xenon within the glass cell to solidify and the glass cell to assume a pressure reducing state.**

It is respectfully submitted that the cited art does not disclose cooling an isolated glass cell filled with solid rubidium and xenon gas to solidify the xenon gas so that the glass cell is filled with solid rubidium and solid xenon in a vacuum.

Independent apparatus **claim 18** distinguishes over the cited art based at least upon the following claim limitations:

- apparatus for **producing a glass cell having solid rubidium and solid xenon in a vacuum** therein, comprising:
- means for cooling the glass cell causing rubidium to precipitate as a solid within the glass cell;
- means for **filling the glass cell having solid rubidium with xenon gas**; and
- means for **cooling the filled glass cell causing xenon within the glass cell to solidify and the glass cell to assume a pressure reducing state.**

It is respectfully submitted that the cited art does not disclose cooling a glass cell filled with solid rubidium and xenon gas to solidify the xenon gas so that the glass cell is filled with solid rubidium and solid xenon in a vacuum.

New Claims 19-21

New **claims 19 and 20** ultimately depend from claim 10 and distinguish over the cited art for at least the same reasons as claim 10. **Claim 19** further distinguishes over the cited art based at least upon the following claim limitations:

- wherein output from the glass cell may be used in an NMR/MRI process **without first being frozen**. (Support at original specification at page 6, lines 2-5).

Although it is respectfully submitted that Shino et al. cannot be combined with Ryan et al. as per the Examiner's suggestion, it is further respectfully submitted that such a combination would require that the output xenon gas first be frozen as taught by Shino et al. before it could be used in an NMR/MRI process. This is because such combination would include impurities that need to be removed.

Claim 20 further distinguishes over the cited art based at least upon the following claim limitations

- **after said removing and introducing, isolating the glass cell to prevent entry or exit of contents;**
- **cooling the isolated glass cell sufficiently to solidify xenon gas content**; and

- **repeating the steps of removing and introducing.**

It is respectfully submitted that the cited art does not disclose a method of producing nuclear spin polarized xenon gas in a cyclical process in which xenon gas is introduced while the spin polarized xenon gas is being removed, wherein at times the glass cell is isolated and the added xenon gas is solidified before repeating the introducing of xenon gas and removal of spin polarized xenon gas. Support for this embodiment is found in the original specification at page 8, lines 12-16.

New **claim 21** introduces similar limitations to claim 16 as claim 20, although in means for formatting. Accordingly, claim 21 further distinguishes over the cited art for the same additional reasons as given for claim 20. Support for the limitations introduced in claim 21 also are found in the original specification at page 8, line s12-16.

Double Patenting Rejections:

Claims 1-8 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-16 of Hattori et al. (U.S. Patent No. 7,541,051) in view of Shino et al. (U.S. Patent No. 5,039,500).

Claim 9 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-16 of Hattori et al. (U.S. Patent No. 7,541,051) in view of Ryan et al. (U.S. Patent No. 5,934,103).

It is respectfully submitted that the Hattori et al. patent and the subject application have common ownership. Please see the assignment recorded for the subject application on July 8, 2005 at reel 017367, frame 0541. Attached is a terminal disclaimer in compliance with 37 CFR 1.371(c) which obviates the double patenting rejection. Accordingly, withdrawal of the double patenting rejections is requested.

Terminal Disclaimer Fee

A terminal disclaimer in compliance with 37 CFR 1.321(d) is herein filed. **The fee of $140.00 for the Terminal Disclaimer is provided for in the charge authorization presented in the PTO Form 2038, Credit Card Payment form, provided herewith.**

Request for Extension of Time

Applicants respectfully request a one month extension of time for responding to the Office Action. **The fee of $130 for the extension is provided**

for in the charge authorization presented in the PTO Form 2038, Credit Card Payment form, provided herewith.

If there is any discrepancy between the fee(s) due and the fee payment authorized in the Credit Card Payment Form PTO-2038 or the Form PTO-2038 is missing or fee payment via the Form PTO-2038 cannot be processed, the USPTO is hereby authorized to charge any fee(s) or fee(s) deficiency or credit any excess payment to Deposit Account No. 10-1250.

In light of the foregoing, the application is now believed to be in proper form for allowance of all claims and notice to that effect is earnestly solicited.

Respectfully submitted,
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